ORIGINAL

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Part 97 of the	)	**RM-_____**
Commission's Rules Governing	)	
the Amateur Radio Service to	)	
Facilitate Spread Spectrum	)	
Communications	)	

To: The Commission

PETITION FOR RULE MAKING

The American Radio Relay League, Incorporated

Christopher D. Imlay
BOOTH FRERET & IMLAY, P.C.
1233 20th Street, N. W.
Suite 204
Washington, D. C. 20036
(202) 296-9100

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SUMMARY

The American Radio Relay League, Incorporated (the League), the national association of amateur radio operators in the United States, respectfully requests that the Commission issue a Notice of Proposed Rule Making at an early date, looking toward the amendment of the Commission's Rules and Regulations regarding the Amateur Radio Service, in order to facilitate, to a greater extent than is done by the present rules, the contributions of the Amateur Service to the development of spread-spectrum communications.

The petition proposes (1) to permit brief test transmissions using SS emissions; (2) to permit international SS communications between United States' amateurs and amateurs in countries that permit amateur use of those emissions; (3) deletion of unnecessary restrictions on spreading codes and repetitive definitions of "harmful interference"; and (4) to provide for automatic power control to insure use of minimum necessary power to conduct SS communications.

The League urges that the Commission propose and ultimately adopt these proposed rule changes. These are, in the League's opinion, the minimum changes necessary in order to foster SS experimentation in the Amateur Service, while at the same time preserving those necessary existing protections against those who might conceivably exploit the amateur bands for non-amateur purposes. Spread-spectrum techniques are in regular use in Part 15 applications, but have not been given the attention deserved in other communications systems, such as the land mobile services, as a means of increasing the efficiency of use of crowded shared bands. The Amateur Service regularly functions as a provider of refinements of new technologies and provides means of deployment of those technologies on a cost-effective basis. In order to permit the degree of flexibility in use of this technology in particular, the Commission should provide the necessary regulatory environment to do so. These rule changes represent a conservative, and yet functional approach to reform of SS rules.

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PETITION FOR RULE MAKING

The American Radio Relay League, Incorporated (the League), the national association of amateur radio operators in the United States, by counsel and pursuant to Section 1.401 of the Commission's Rules (47 C.F.R. §1.401) hereby respectfully requests that the Commission issue a Notice of Proposed Rule Making at an early date, looking toward the amendment of the Commission's Rules and Regulations regarding the Amateur Radio Service as set forth in the attached Appendix. The purpose of the proposed rule changes is to facilitate, to a greater extent than is done by the present rules, the contributions of the Amateur Service to the development of spread-spectrum communications. As good cause for the proposed changes, the League states as follows:

I. Introduction

1. Use of spread spectrum communications in the Amateur Service is relatively new. It was first authorized by the Commission by Report and Order, 58 RR 2d 328 (1985). The Commission authorized spread-spectrum communications in the Amateur Service in

order to permit amateurs to develop, test and operate low-cost spread spectrum systems, thus to stimulate technical advances in radio technology, consistent with the basis and purpose of the Amateur Service (47 C.F.R. Section 97.1). The specific benefits to the public to be gained from amateur use of spread-spectrum (SS) communications as determined by the Commission included the following: 1) Reduced power density and concomitant reduction of interference to narrow band communication systems; 2) Significant improvements in communication under conditions with poor signal-to-interference ratio; 3) Improved communication performance in selective fading and multipath environments; and 4) Ability to accommodate more communication channels functioning simultaneously in the same spectrum than is possible using frequency division multiple access exclusively.

2. Since the time SS communications were first authorized in the Amateur Service in mid-1985, there have been some experimental amateur operations using SS techniques, but its use has not been widespread. The League believes that one significant reason for this reduced level of experimentation is due to limitations in the rules governing SS communications in the Amateur Service. The revised rules in the proposed appendix are intended to provide increased flexibility in the use of this mode, to encourage amateurs to experiment and use SS communications, to develop new techniques for increased spectrum efficiency using this mode, and to improve compatibility with narrow-band modes.

II. Spread-Spectrum Communications Rules Should Be Flexible

3. Commission policy is and has been to encourage experimentation and to provide a regulatory environment for the Amateur Service which encourages modern techniques, technology and uses of amateur radio.[1]

4. SS communications are well-suited to the Amateur Service, especially in shared bands. Amateur experimentation in SS communications, in view of the apparent compatibility of SS communications and narrow-band modes commonly used in the Amateur Service, is of potential benefit in terms of spectrum efficiency. This was noted by the Commission in Docket 81-414. There were some concerns expressed by commenters in that proceeding. These initial objections fell into three categories: 1) concern about intra-service interference; 2) concern about inter-service interference; and 3) concern about monitoring issues, and the ability to protect the Amateur Service against interlopers. These issues are not of practical concern now, and they are not anticipated to become significant under the proposed revised SS rules. There have not been, in the League's experience, any established instances of actual interference to narrow-band amateur communications from SS communications. Tests conducted by amateur groups have established that certain configurations of SS operations can, due to increased in-band noise, trigger amateur repeater inputs (if those repeaters are carrier-operated), but that potential interaction is easily

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[1] See, the Notice of Proposed Rule Making, 3 FCC Rcd. 2076 (1988).

avoided by selection of spread-spectrum parameters. 58 RR 2d at 329, and authorities cited therein at footnotes 4-9. There are potential interactions between SS and narrow-band modes in certain circumstances, depending on processing gain and the randomness of spreading codes, however.[2] There have been no reported instances whatsoever, in the League's experience, of interference to other radio services from amateur SS communications.[3]

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[2] These potential interactions are no different than those involving other mode compatibility issues in the Amateur Service except that current rules require protection by amateurs using SS emissions of users of other modes. 47 C.F.R. §97.311(b). Conflicts are avoided by informal band planning and normal sharing considerations which work well in the crowded amateur bands. Avoidance of weak-signal subbands by SS operations is a reasonable preventative step.

[3] In Docket 81-414, the Commission addressed concern by the National Association of Broadcasters (NAB) about interference to television channel 2 (54-60 Mhz) reception from amateur SS operation at 50-54 MHz as follows:

> ...NAB's principal concern was that uncontrolled amateur transmissions might fall outside the allocated band into channel 2. The Commission believes that NAB's concerns are not well founded. First, rather simple transmitter output filters can be used by amateur licensees to prevent positively out of band emissions. Second, licensees in the Amateur Service have had no significant history of operating outside the allocated bands...In other frequency bands where the Amateur Radio Service has successfully shared allocations with different services, we expect no worsening of interference since the power density from currently existing narrow band transmissions having the same total effective radiated power.
>
> 58 RR 2d at 330.

The Commission also noted that the NAB's concerns were moot, since the authorization for SS communications extended only to bands above 225 MHz. 47 C.F.R. §97.305.

5. Notwithstanding the Commission's general support of Amateur SS communications, as stated in the Report and Order in Docket 81-414, the rules adopted in that proceeding were quite circumscribed. The limitations were principally aimed at facilitating station identification by other amateur stations, and limiting spreading sequences by specifying a limited number of linear feedback shift registers. SS communications are currently authorized only for domestic communications,[4] and the frequencies available for SS communications were in the bands above 225 MHz.[5] They remain as originally enacted, to the present date.

6. The Commission has generously granted and extended Special Temporary Authority for SS experimentation, however. The experiences of amateurs pursuant to these past Special Temporary Authorities indicate that the present rules include certain significant limiting factors which could be liberalized without detracting at all from other, narrow-band amateur communications.

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[4] In the Commission's rewrite of the Amateur Rules, commenced in 1988, the Commission deleted from the rules the reference to international use of SS communications because no international agreements had been enacted to facilitate such. The Commission indicated in Docket 88-139 a willingness to consider international use of SS communications if there were international agreements enacted to permit such. No specific agreements have been enacted on that subject to date.

[5] The original proposal of the Commission in Docket 81-414 was to permit SS communications only in the 50, 144 and 220 MHz bands. Those bands were not authorized by the Report and Order because of certain comments which noted the limited size of the allocations and required limitations in bandwidth. Therefore, the Commission authorized operation only in the UHF and SHF bands.

It is the League's belief, and apparently that of Commission staff as well, that experimentation in the Amateur Service, and particularly further SS experimentation, should be accommodated by increased flexibility in the rules, and not by reliance on STAs. According to a report by Mr. Buaas, K6KGS, holder of a Commission STA, which report was filed with the Chief, Private Radio Bureau in March of 1993:

> Our work to date has focused on determining: a) what performance can be achieved utilizing several techniques in spectra already occupied by narrowband emitters; b) what level of interference results to existing users; c) what impact existing usage has on degrading SS performance; d) how much usage can be pressed into a given spectrum using CDMA; and e) what proposals we might make to change the Rules and thereby further encourage experimentation without the need for this STA.
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> *****
>
> Several of our experiments have been particularly successful. We started with designs which would meet the limits set forth for Part 15 systems, and worked up from there. One hybrid design (DS coupled with slow FH) was particularly effective in minimizing interference...
>
> *****
>
> It is now clear to us that use of SS in the Amateur Service has been severely limited by the design restrictions in the Rules...

The League agrees that it is useful to relax somewhat the rules contained in Sections 97.305(b) and 97.311 governing amateur SS operation, to permit greater operating flexibility and the development of SS communications as a practical communications mode in the Amateur Service without adverse interaction with other modes.

III. Proposed Rule Changes

7. The first change proposed by the League is to permit brief test transmissions of SS emissions, as is permitted in Section

97.305(b) for other types of emissions, except that test transmissions using SS emissions would be limited to those frequency bands where SS emissions are authorized generally, as is the case with pulse modulation transmissions.

8. Second, it is proposed to amend Section 97.311(a) of the Rules to modify the requirement that SS communications be limited only to domestic communications. Amateur communications have always been permitted internationally between countries that permit it, and SS emissions should not be prohibited between United States amateurs and amateurs in countries where those emissions are permitted as well.

9. The reference in §97.311(b) to unintentional triggering of repeater inputs, a reference in the rules governing SS communications since 1984, is unnecessary because it is merely repetitive of existing definitions of "harmful interference" in the ITU Radio Regulations and in Commission definitions and interpretations generally. Harmful interference for non-safety-of-life radio services does not include squelch breaks and repeater activation.[6]

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[6] See, the ITU Radio Regulations, at Article 1, in which "Harmful Interference" is defined as interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with these regulations. A virtually identical definition appears at 47 C.F.R. §97.3(a)(22). Past Commission interpretations of interference to amateur repeaters have consistently applied the definition of "harmful interference" to exclude mere squelch breaks. And, the Commission held in an Order dismissing RM-7673 (DA-92-155, released February 10, 1992) there are "many other methods" available to prevent unintended triggering of repeaters besides restricting SS emissions.

10. It is proposed to delete Subsections 97.311(c) and (d), in order to permit hybrid frequency-hopping (FH) and direct-sequence (DS) emissions, and spreading codes not currently permitted by the rules, but which are desirable. The current rules permit only two techniques, neither of which is optimal for sharing. There are newer codes, including those used by Part 15 device manufacturers, which have been optimized to avoid interaction with shared users. These could be used if the rules were more flexible. Elimination of the rule limiting amateurs to specific spreading sequences is necessary to facilitate experimentation. The proposed rule changes would delete the limitations on SS configurations contained in the present Section 97.311(d). This modification is necessary to provide sufficient flexibility to experiment with other spreading sequences, tap settings and frequency hopping techniques. Nor will the changes create any difficulty with station identification,[7] or with protection of the Amateur Service from commercial or unlicensed encroachment. The narrow-band identification requirement is sufficient, together with the documentation requirement in Section 97.311(e) of the Rules, to permit the degree of monitoring of SS activities of amateurs necessary to protect the Service. As the Commission appropriately recognized in addressing

[7] It is not proposed to modify the station identification provisions in Section 97.119(b)(5) which contains the CW identification requirement for SS communications. The League questions the practicality of the requirement, in view of the variability of frequency on which the narrowband CW identification requirement may be located. Nonetheless, it is not proposed to delete the requirement at this time.

monitorability of unspecified digital codes in the Amateur Service, quoted in the Report and Order in Docket 81-414:

> In balancing our objectives of encouraging new technologies against ensuring our enforcement capability, it must be recognized that there is an incompatibility between authorizing experimentation with "exotic" technologies and the employment of channel monitoring as an enforcement tool. Our ability to verify that the content of messages complies with our rule requirements will be hindered by the broad relaxation of regulatory constraints that we are ordering in this proceeding. However, the Commission agrees...that special provisions we are including in the final rules, as well as existing provisions that identification be made in plain English or the international Morse code, should, when combined with the zealous effort of the amateur community to protect their allocated frequency bands, provide adequate protection against unauthorized operation in the service. 58 RR 2d at 330.

11. Finally, the proposed appendix would amend Section 97.311(g), to provide for automatic transmitter power control which would limit output power to that which is required for the communication, when more than one watt of transmitter power is used. This is a simple matter to accomplish technically, and it will insure compliance with Section 97.313(a) of the rules, which requires the use of minimum transmitter power. It will also minimize any potential for interference to other amateur stations and insure maximum spectrum efficiency.

IV. Conclusion

12. The League urges that the Commission propose and ultimately adopt these proposed rule changes, which are in the League's opinion the minimum necessary changes in order to foster SS experimentation in the Amateur Service, while at the same time preserving those necessary existing protections against those who

might conceivably exploit the amateur bands for non-amateur purposes. Spread-spectrum techniques are in regular use in Part 15 applications, but have not been given the attention deserved in other communications systems, such as the land mobile services, as a means of increasing the efficiency of use of crowded shared bands. The Amateur Service regularly functions as a provider of refinements of new technologies and provides means of deployment of those technologies on a cost-effective basis. In order to permit the degree of flexibility in use of this technology in particular, the Commission should provide the necessary regulatory environment to do so. These rule changes were developed by a dedicated committee of League staff and volunteers familiar with the technology, and represent a conservative, and yet functional approach to reform of SS rules.

Therefore, the foregoing considered, the American Radio Relay League, Incorporated respectfully requests that the Commission issue a notice of proposed rule making to implement the rules contained in the attached Appendix, and adopt the same after an opportunity for notice and public comment.

Respectfully submitted,

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

By _____
Christopher D. Imlay
Its General Counsel

225 Main Street
Newington, CT 06111

BOOTH FRERET & IMLAY, P.C.
1233 20th Street, N.W., Suite 204
Washington, D.C. 20036
(202) 296-9100
December 12, 1995

APPENDIX

Section 97.305(b) is amended to read as follows:

> (b) A station may transmit a test emission on any frequency authorized to the control operator for brief periods for experimental purposes, except that no pulse or SS modulation emission may be transmitted on any frequency where pulse or SS is not specifically authorized.

Section 97.311(a) is amended to read as follows:

> (a) SS emission transmissions by an amateur station are authorized only for communications between points within areas where the amateur service is regulated by the FCC and between an area where the amateur service is regulated by the FCC and an amateur station in another country which permits SS communications for its amateur licensees.

Section 97.311(b) is amended by deleting the last sentence thereof.

Section 97.311(c) and (d) are deleted in their entirety.

Section 97.311(g) is amended to read as follows:

> (g) The transmitter power output must not exceed 100 W under any circumstances. If more than 1 W is used, automatic transmitter control shall limit output power to that which is required for the communication. This shall be determined by use of the ratio, measured at the receiver, of the received energy per user data bit (Eb) to the sum of the received power spectral densities of noise (N_0) and co-channel interference (I_0). Average transmitter power over 1 W shall be automatically adjusted to maintain an $Eb/(N_0+I_0)$ ratio of no more than 23 dB at the intended receiver.